

The use of microchannels as an electron gun source for the Polywell

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A new and simple type of electron gun is presented. Unlike conventional electron guns, which require a heated filament or a discharge, extractor, accelerator and focusing electrodes, this gun uses the collimated electron microchannels of an IEC discharge to achieve the same outcome. A cylindrical cathode is placed coaxially within a cylindrical anode to create the discharge that produces collimated beams of electrons that emerge along the axis. This geometry essentially isolates one of the microchannels that emerge in a negatively biased IEC grid. The operating pressure range of the gun is 10 - 100 mTorr. As a result, a small aperture separates the gun from the main vacuum chamber in order to achieve a pressure differential, which enables the Polywell that is located within the chamber to operate in the units of mTorr pressure range. The collimated electron beam emerges from the aperture into the vacuum chamber and can be injected into the Polywell. The performance of the gun is unaffected by the pressure differential between the vacuum chamber and the gun.